

TORQSEAL VALVES

**MAINTENANCE MANUAL,
Triple Offset, Metal-Seated Butterfly Valve
3–36", (80–900 mm)**



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I INTRODUCTION

1.1 GENERAL INTRODUCTION

VELAN

This manual has been prepared by VELAN engineers, designers, R & D and technical personnel to assist you in obtaining many years of satisfactory service from your Butterfly Valves. It will assist you in restoring your valve to best working condition with minimum of time and expense.

VELAN Valves are designed and manufactured based on many years of research and product development and are constantly being improved. Before beginning any major works, we recommend that you read this booklet carefully at least once to understand the valve's physical condition.

Please note that if you do not understand the reason for the service problem, we suggest that you get in touch with your local VELAN representative or call the Field Engineering Service Manager for technical assistance. 514-748-7743-ext.2226.

Before beginning any major work, we recommend that you carefully check the nameplate of the valve and record the figure number and the tag number to identify the type and size of valve. See the "Essential Features of VELAN valves" (Section 1.3) for an explanation of VELAN "Figure Numbers."

I INTRODUCTION

1.2 TYPES OF BUTTERFLY VALVES

Velan butterfly valves cover a range of sizes and pressure classes. Each of them is built in Four basic body styles:

1. Lug/Single Flange
2. Wafer Type
3. Double Flanged "Short Pattern"
4. Double Flanged "Long Pattern"

- Double Flanged type which can be installed between two flanges using gaskets and fasteners.
- Wafer Type which can be installed between two flanges.
- Lug/Single Flange which can be installed between two flanges and or bolted to either flange.

For stem sealing options see section 5.1

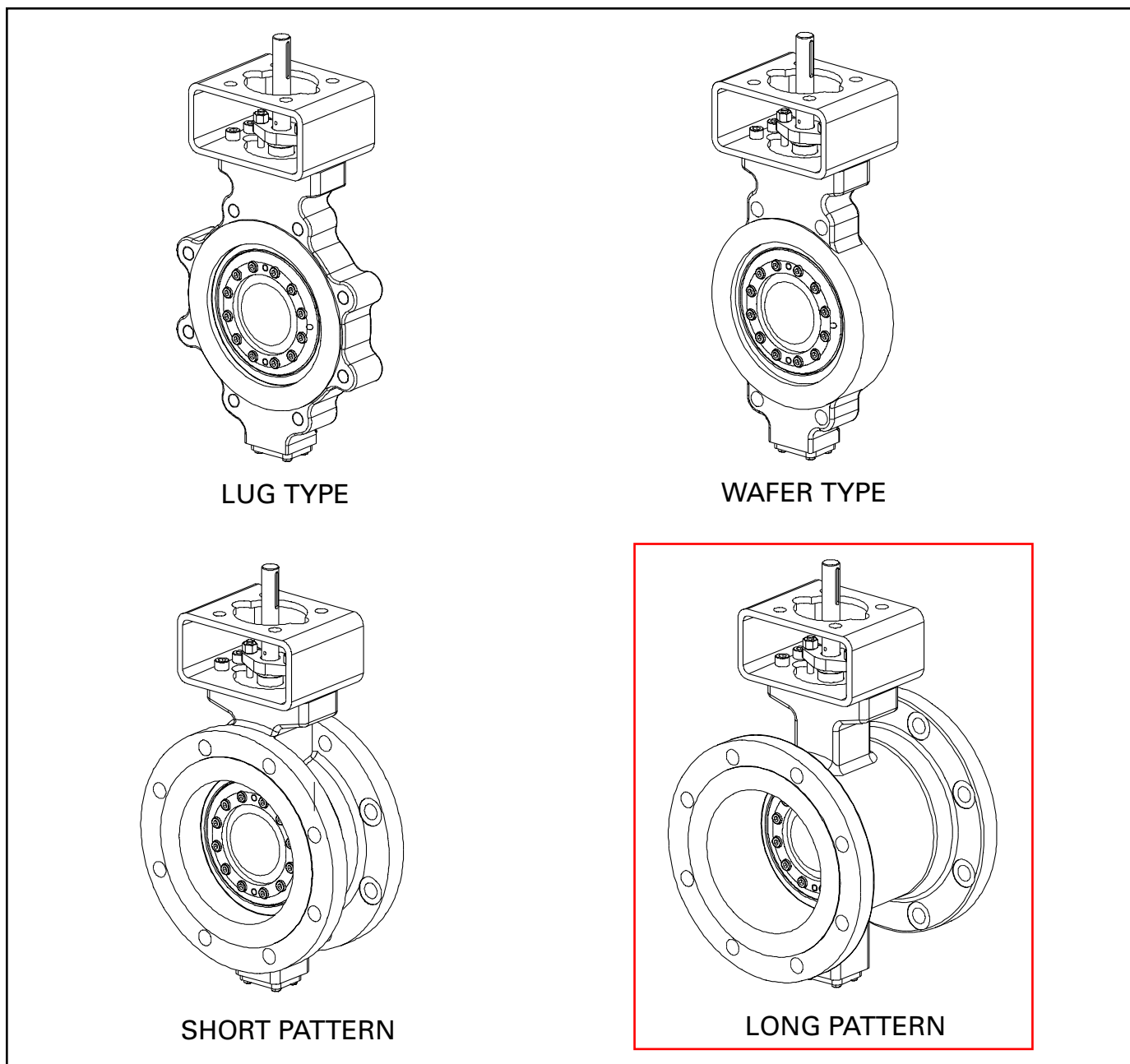


Figure 1.2 Four Basic Body Styles

I INTRODUCTION

1.3 ESSENTIAL FEATURES OF VELAN VALVES

Metal-Seated Triple Offset Butterfly Valves												
TYPE OF CONNECTION	SIZE OF CONNECTION*		PRESSURE RATING	VALVE TYPE	SEAT/SEAL MATERIAL	BODY MATERIAL		BEARING MATERIAL	DISC MATERIAL	SHAFT MATERIAL	SPECIAL SERVICE OR DESIGN	
A	B		C	D	E	F		G	H	I	J	
F	1	4	—	1	B	A	O	2	—	D	C	A
EXAMPLE: Flanged, 6", Class 300, metal seal in disc, short pattern, carbon steel with stainless steel trim.												
A TYPE OF CONNECTION												
A – Special B – Butt weld C – Combination D – Flanged, B16.5 (MSS > 24") E – Lug F – Flanged, API 605 > 24" G – Flanged, ring joint H – Wafer I – Undrilled flanges												
B *SIZE OF CONNECTION												
Customers have the choice of specifying valve size as part of the valve figure number ("B") using the numbers below, or indicating valve size separately.												
EXAMPLES: F14-1BA02-DABA (valve size is part of figure number) 3" F-1BA02-DABA (valve size is shown separately)												
10-3" (80 mm) 11-3½" (90 mm) 12-4" (100 mm) 13-5" (125 mm)												
14-6" (150 mm) 15-8" (200 mm) 16-10" (250 mm) 18-12" (300 mm)												
19-14" (350 mm) 20-16" (400 mm) 21-18" (450 mm) 22-20" (500 mm)												
24-24" (600 mm) 26-26" (650 mm) 28-28" (700 mm) 30-30" (750 mm)												
32-32" (800 mm) 34-34" (850 mm) 36-36" (900 mm) 99- Special												
C PRESSURE RATING												
0- 150 1- 300												
D VALVE TYPE												
A – Metal seat seal in disc (API 609 Long Pat.) ASME B16.10 B – Metal seat seal in disc (API 609 Short Pat.) ISO 5752 C – Metal seat seal in disc lug, wafer												
E SEAL RING												
A – SS 316 + Grafoil B – SS 410 + Grafoil C – Monel + Grafoil D – Alloy 20 + Grafoil E – Inconel + Grafoil F – Hastelloy + Grafoil G – SS 316 (solid) H – Monel (solid) J – Alloy 20 (solid) K – Inconel (solid) L – X-m19, (Nitronic 50) P – Duplex SS + Grafoil Z – Special												
F BODY MATERIAL												
01 – Special 02 – A105, WCB 03 – Carbon moly, F1, WC1 04 – Chr. moly, F5, C5 05 – Chr. moly, F11, WCC6 06 – Chr. moly, F22, WCC6 09 – Chr. moly, F9, C12 10 – Stainless steel F316H 13 – Stainless steel F316, CF8M 19 – Monel 20 – Inconel C 21 – Hastelloy Gr.5 22 – Titanium 23 – Alloy 20 31 – LCC 32 – Stainless steel F51 34 – F91 37 – Incoloy												
G BEARING MATERIAL												
A – SS 316 Nitrided B – XM19, (Nitronic 50) C – CS Nitrided D – SS Chrome plated E – Monel F – Inconel G – Hastelloy H – Alloy 20 J – Stellite												
H DISC												
A – Same as body plated B – Same as body not plated C – SS 316, CF8M E – Monel F – Inconel G – Hastelloy H – Alloy 20 Z – Special												
I SHAFT												
A – SS 410 B – SS 316 C – XM19, (Nitronic 50) D – SS 630 E – Monel F – Inconel G – Hastelloy H – Alloy 20 Z – Special J – SS 660												
J SPECIAL SERVICE												
A – Standard C – Chlorine service F – LNG G – Oxygen service H – Cryogenic service I – NACE J – Vacuum service N – Nuclear P – Powders R – Coker X – Special												

2.1 RECEIVING INSPECTION

All valves must be examined for signs of damage that may have occurred during handling and transportation. Any damage should be analyzed and a report should be issued. Serious damage should be reported to your local Velan representative or to The Customer Service Manager and also to the Transport Carrier so that a suitable arrangement for repairs can be made without delay.

2.2 QUALITY CONTROL DOCUMENTATION

For valves purchased with Quality Control (QC) certification, documents must verify the package of documents to see that the Quality Control documents are completed as per the purchase order.

2.3 STORAGE

Valve should be stored in a suitable sheltered place to prevent contamination by weather, dirt or dampness. The valve is shipped with end protectors on the inlet and outlet which should remain on the valve until it is ready for installation.

NOTE: If actuators are involved, please refer to the applicable manufacturer's instructions for storage.

2.4 HANDLING AND PREPARATION

On large valves, a hoist is needed to assist installation. A nylon sling should be placed under the valve body so that the unit can be lifted vertically to its final destination. Ends protectors must be removed from all types of valves prior to installation and connections must be checked for cleanliness. Any visible foreign matter must be removed from end connections of the valve. The flanges must be cleaned properly with suitable solvent such as acetone or alcohol. Do not use solvents containing chloride or fluoride.

2.5 SPECIAL INSTRUCTIONS FOR BUTTERFLY VALVES

2.5.1 Inspection

Carefully remove the valve from the shipping package (box or pallet) to avoid any damage to the valve and components or, in the case of automated valves to the electric, pneumatic/hydraulic actuator or instrumentation.

Prior to installation, clean the inside of the valve. Ensure that there are no solid objects such as bits of wood, plastic or packaging materials within the valve or on the valve seat.

Inspect the seal ring to ensure that it was not damaged during transportation and handling. This is especially important in the event of valves with "fail-open" actuators.

Verify that the materials of construction listed on the valve nameplate are appropriate for the service intended and are as specified.

Locate the "HP" marking on the body which defines the preferred mounting orientation in respect to the pressure. In most cases the valve is properly installed when the actuator fluid flow or high pressure is acting on the shaft side of the disc when the valve is closed.

Ensure that the packing flange bolting nuts against the packing flange cannot be rotated by hand.

2.5.2 Installation

Velan recommends that all common safety practices be followed during installation of the valve into the line.

Recommended installation orientation is with valve shaft horizontal or inclined from vertical. This will minimize any problems associated with solid particles present in the process that otherwise could deposit in the lower bearing.

Unless recommended otherwise by VELAN, mount the valve in preferred direction, with the "HP" marking pointing to the lower pressure side so that the shaft side of the disc will be upstream when the valve is in closed position.

WARNING: The use of impact wrench to install & assemble Velan Valve is not permitted. Use of such tool can cause valve body seat to deform, and the change in shape may result in leaks or internal bleeding.

For operating temperatures above 392°F (200°C) thermal insulation of body is recommended.

The depth of the tapped holes in the bodies of all wafer valves is specified in the technical literature supplied with the valve. Failure to use correct (size & grade) cap screws/studs may result in damage to the valve.

The valve should be installed in the closed position to ensure that the laminated seal in the disc is not damaged during installation.

Particular care should be taken with those valves equipped with "fail-open" actuators.

If the pipe is lined, confirm that the disc does not contact the lining during the opening stroke, especially in wafer and short pattern body styles. Failure to confirm that the disc rotation does not contact the lining may result in damage to the valve.

II RECEIVING AND PREPARATION FOR INSTALLATION

2.5.2.1. Double Flanged: Long and Short Pattern

Orient the valve with the “HP” marking (preferred side) in the proper position.

Insert the valve between the two flanges until the two bottom holes in the valve body align with the two lower flange holes. Or, as an alternative, insert studs of one half to two times the correct length in the lowest four flange holes. This will allow the valve to rest loosely for the installation of the flange gasket.

Install the flange gasket and remaining flange bolts/studs along with anti-seize compound on the threads.

Using the bolt tightening sequence cross over method, tighten all nuts.

NOTE: Cap screws will be necessary for the top and bottom alignment tapped holes. The studs should be used in the through-holes.

2.5.2.2 Wafer Type

Orient the valve with the “HP” marking (preferred side) in the proper position.

Insert the valve between the two pipe flanges until the alignment holes at either side of the valve match and align the corresponding holes in the flanges (assuming horizontal position). Do not use the valve to align mis-aligned piping.

Insert a long cap screw or stud through the flange and thread it into the body/flange. This will allow the valve to center and align itself properly for the installation of the flange gasket.

Install the flange gasket and the remaining flange cap screws/studs/nuts etc.

Remove the long cap screws/studs from the lower alignment holes and replace with the correct fasteners.

Using the cap screw tightening sequence, tighten all flange screws, incrementally. Maintaining uniform clearance around studs and flange holes.

Seat the flanges by tightening the flanges cap screws/studs, little at a time until flanges face seats. During this operation it is recommended to continuously check the distance between the flange faces and select the tightening sequence to maintain the parallelism of the both mating flanges.

Complete the final torquing of the flanges in 3 to 4 increments to the recommended torque valve.

2.5.2.3 Lug Type

Orient the valve with the “HP” marking (preferred side) in the proper position.

Insert the valve between the two flanges until the two bottom holes of the valve align with the two lower flange holes.

Insert cap screw or stud through the flange and screw it into valve body holes. This will allow the valve to center and align properly for the installation of the flange gasket. The connecting flange face may not be more than $\frac{1}{4}$ ” away from the valve flange face. Do not use the valve to align mis-aligned piping.

Install the flange gasket and the remaining flange cap screws.

Use Anti-seize compound around fastener threads.

Remove the two extra long cap screws/studs from the lower alignment holes and replace them with correct sized cap screws/studs.

Tighten all flange cap screws/studs as per tightening sequence in 3 to 4 increments, to the recommended torque.

2.5.3 Valve Verification

Tightening the packing flange as per torque table to prevent stem leakage. Over-tightening will decrease packing life and increase operating torque (rim pull) requirements.

Check the operation of the valve by stroking to “100% open” to “100% close”. To determine the orientation of the disc, the index marking on the shaft is aligned with the corresponding marking on the body in the closed position.





The valve disc travels clockwise to close/counter clockwise to open.

For automated valves, set the air pressure/electrical voltage for at least the minimum given to select the actuator. For pneumatic actuators, do not apply more than 1.25 times the pressure for which the actuator was designed. (Work with the sizing sheet from engineering).

NOTE: For springs return actuators with positioners, overpressure will cause excessive time delay in obtaining a spring movement for the valve disc to open or close.

The use of impact wrenches to install a Velan valve is not permitted, use of the impact wrenches can cause body seat to change the geometry of valve body and internal component (shape), increasing the possibility of valve leakage or internal grinding.

FOR SAFETY REASONS,
it is important to take these precautions
before removing a valve from a line.

-  Personnel making adjustments to the valves should wear safety equipment normally used to work with fluid in the lines where the valve is installed.
-  Before removing a valve from a line, line pressure must be relieved with no exception. Failure to do so may cause serious personal injury and/or equipment damage.
-  Velan valves can be equipped with a variety of manual gear, electric, hydraulic or pneumatic actuators. Generally, all pressure must be relieved from both sides of the valve (inlet & outlet) before the actuators are removed/disassembled.
-  The packing rings must be replaced under no pressure. Removal of the packing with the valve under pressure is at the owner's risk.

Warning on NACE Conversions

It is extremely important to ensure that valves, when converted to NACE trims in the field are done by Velan authorized service shops. Unauthorized conversions can result in failure to carry out post-weld heat treatment and result in severe stress cracks in non-stress relieved areas.

IV GENERAL MAINTENANCE

4.1 OPERATION

4.1.1 General

Velan butterfly valves have been designed to require a minimum of maintenance; all valves require examination before being put into service/operation. Additionally, valves should be inspected regularly during operation and should receive prompt attention when troubles arise. As a general rule, valves should be subjected to scheduled maintenance.

Generally only maintenance on the packing box is required. If shaft leakage is observed through the packing box, tighten the gland nuts to the torque table.

NOTE: Do not over-tighten packing box gland nuts. Over-tightening will increase the torque required to operate the valve. When tightening the gland nuts, use half-turn increments until leakage has stopped. Respect Torque Table limit. $\pm 10\%$. Refer to Table 4.

4.1.2 Number of packing rings required

All Standard Velan Butterfly valves require five (5) packing rings. (during assembly verify with drawing) For valves equipped with a leak off connection, and Lantern ring seven (7) are required. Four (4) packings are placed below the lantern ring and three (3) above.

The following sketches show the four types of packing arrangements on Butterfly valves.

STANDARD LOW EMISSION STEM SEAL WITH 0-20 PPM

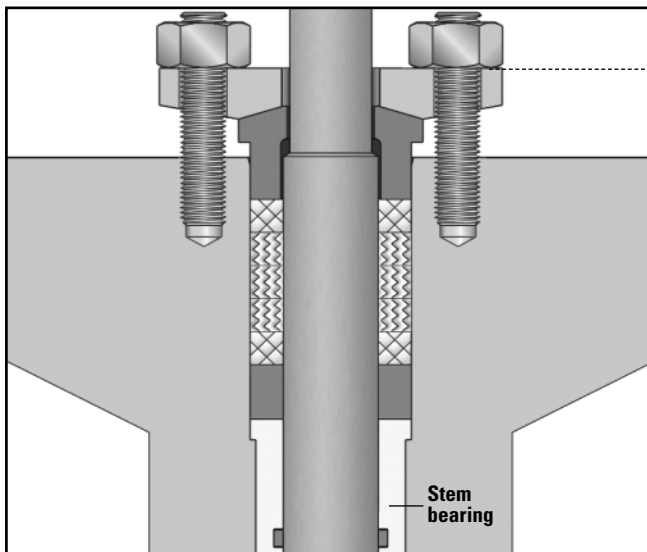


Figure 4.1.2A

EFV (ENVIRONMENTALLY FRIENDLY VALVE) STEM SEAL WITH "0" HELIUM BUBBLES

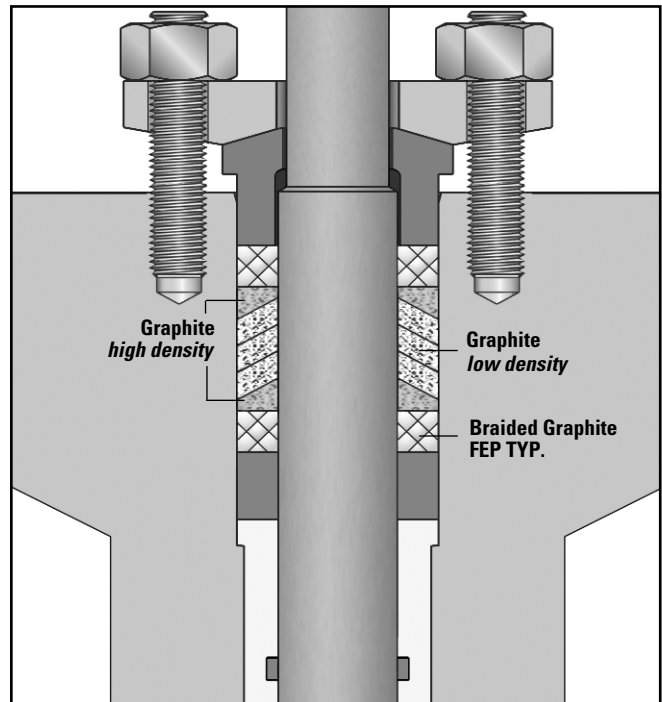
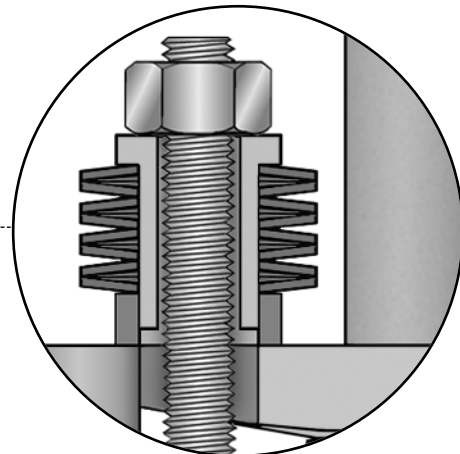


Figure 4.1.2B

OPTIONAL LIVE-LOADING



THE TA-LUFT SEAL WITH LESS THAN 1 PPM (0.0014 PPM)

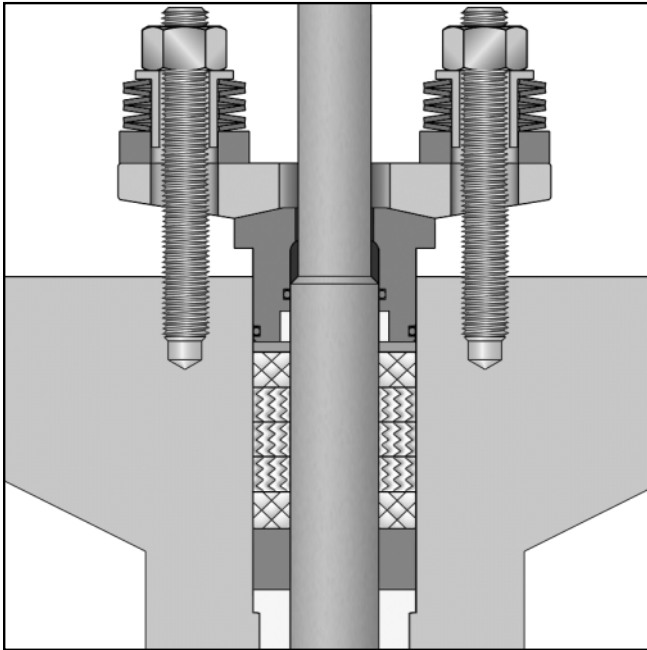


Figure 4.1.2C

LANTERN RING OPTION DOUBLE PACKED WITH LEAK-OFF MONITORING PURGE PORT

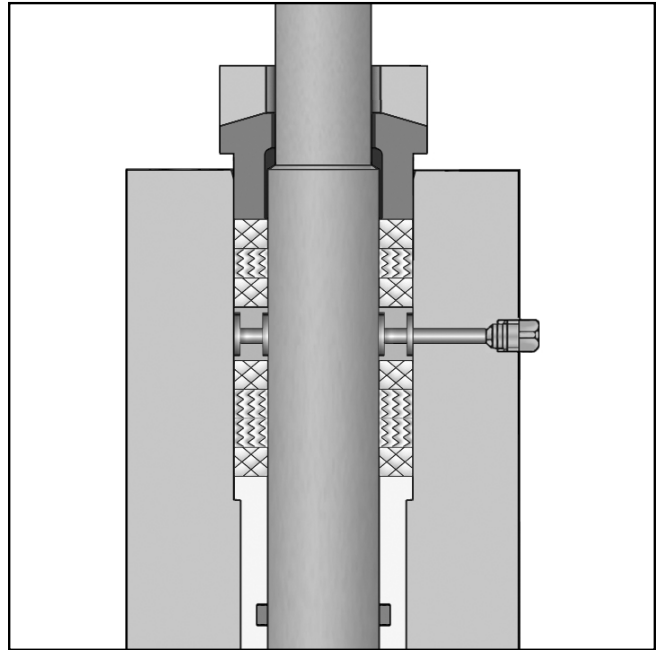


Figure 4.1.2D

4.1.3 Seat Tightness - Closing Torques

Even with a brand new valve, seat tightness will only be achieved when sufficient load has been applied to the disc. This load varies with the pressure differential against which the valve has to be closed or opened. Torque required to open or close a valve against a given differential pressure is given in the following figure. The torque shown is that torque which has to be applied directly to the Valve stem to achieve tight shut off and does not take into account any mechanical advantage such as that achieved with a gear actuator, cheater bar, etc.

CAUTION: The use of wheel wrenches, cheater bar, etc., is quite common. However, it must be emphasized that these devices

should be used with discretion, and only to achieve approximately the torque as shown in the figure on the following page.

4.1.4 Smoothness of Operation

After complete disassembly of the valve some, internal moving components must be lubricated with recommended lubricants are shown in Table 1. Valves that are not operated frequently and which may remain open or closed for longer periods of time should be cycled (even if only partially) about once every three months.

IMPORTANT: If excessive hand wheel effort is required refer to Troubleshooting chart in Section 5, Table 3.

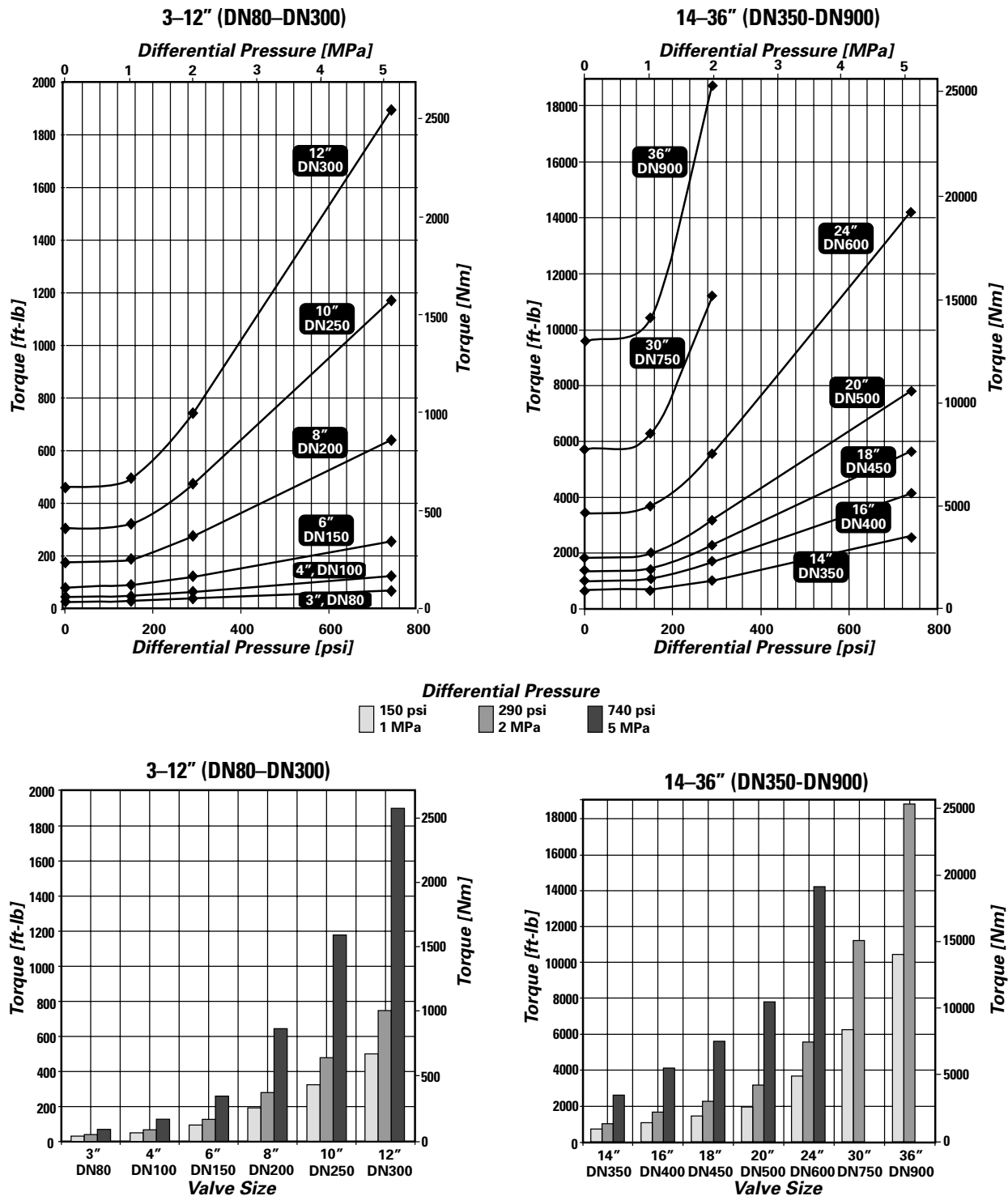
Table 1: Recommended Lubrication

LUBRICATION	PART	FREQUENCY	APPLICATION
Grease: CU 7439 Plus Molykote	Bearing seals	At valve assembly only	Thin layer in bearing seal groove
Anti-seize compound	All bolts and studs except Seal retaining ring bolts (17B)		Thin layer on threads
Dry lubricant: Molykote spray 321R Dry Graphite or equivalent	Laminated seal sliding surfaces		Thin layer applied to mating surfaces of laminated seal, disc and retaining ring

IV GENERAL MAINTENANCE

4.1.5 Closing Torques VS. Differential Pressure For "0" Leakage

The top two graphs show closing torques arranged by valve size. The same curves are valid for both pressure classes. The bottom two diagrams indicate torques related to 150, 290 and 740 psi (1,2 and 5 MPa) differential pressure. **NOTE:** Please contact factory for exact torque requirements.



NOTE: These charts are a guideline for closing torques. If automation is carried out in the field, Velan Engineering department must be consulted for safety factors.

4.2 GENERAL ASSEMBLY INFORMATION

PARTS DESCRIPTION

- 1 - Valve body, Seat
- 2 - Disc
- 3 - Bottom cover
- 4 - Shaft
- 5 - Laminated seal
- 6 - Thrust bearing
- 11 - Packing flange
- 12 - Gland bushing
- 13A - Packing ring
- 13B - Packing ring
- 13C - Bearing protector o-ring
- 15 - Gland stud
- 16A - Gland heavy hex nut
- 16B - Taper pin hex nut (crimped)
- 17A - Actuator bracket hex. socket cap screw
- 17B - Retainer hex. socket cap screw
- 19A - Bottom cover spiral wound gasket
- 19B - Disc spiral wound gasket
- 26 - Key
- 31 - Locking plate
- 55 - Stem bearing
- 56A - Thrust bearing hex. head cap screw
- 56B - Cover heavy hex. headcap screw
- 61A - Taper pin
- 61B - Centering pin
- 61C - Assembly set screw
- 63 - Packing spacer
- 78 - Actuator bracket

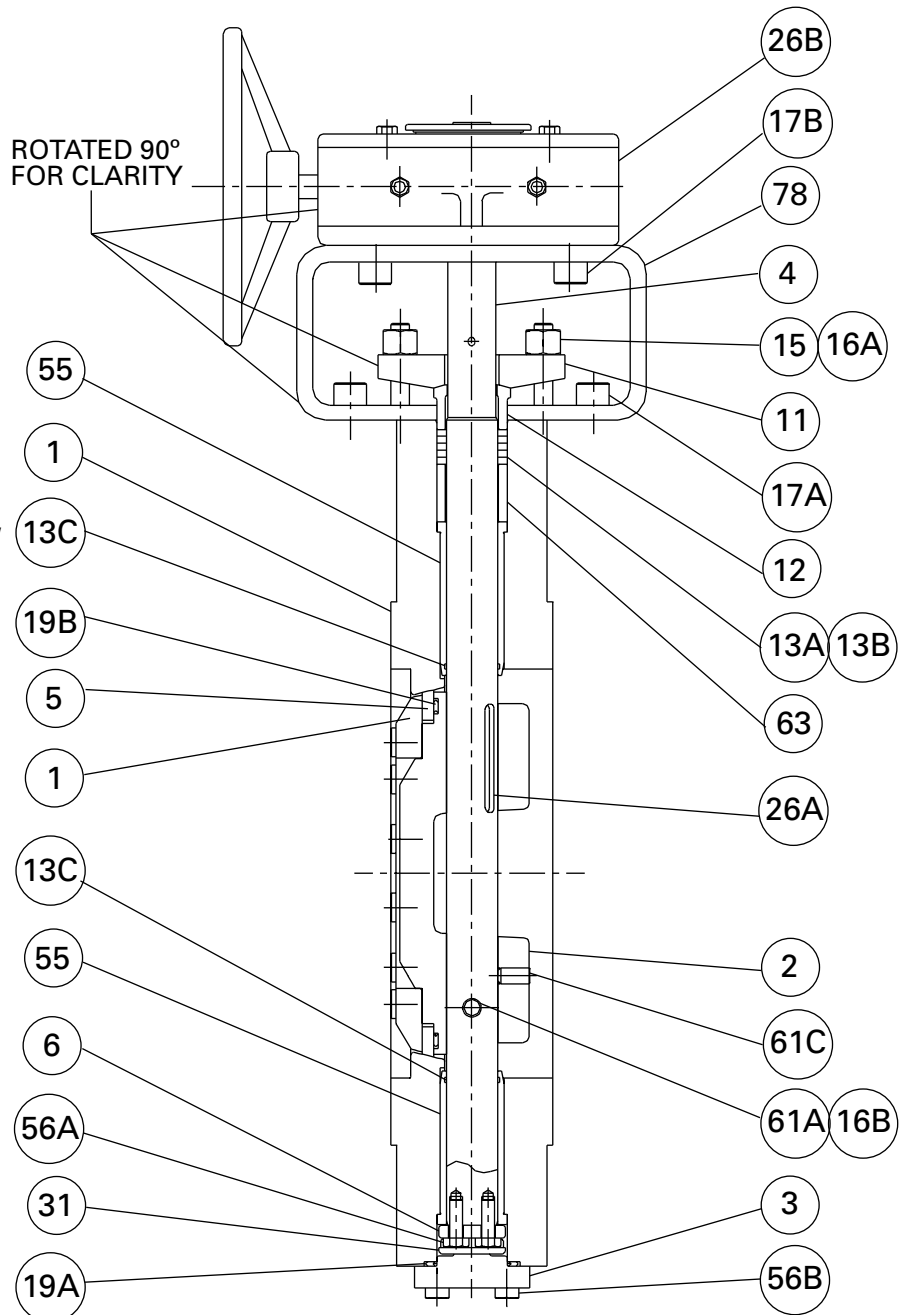


Figure 4.2.1 Butterfly Valve Assembly Drawing

IV GENERAL MAINTENANCE

4.2.1 Butterfly Valve Assembly Drawing

The most important factor to be considered is the cleanliness of all components of valve. All rust and dirt should be removed from all components.

NOTE: The body seat and laminated seal should never be in contact with any abrasive material. Although in some cases, minor scratches can be removed from the seat by polishing with grade 800 or finer paper. Refer to Detailed maintenance Section 6.3.3. Oil and grease should be removed using suitable solvents and lint free rags.

All threaded fasteners (cap, screws, nuts, studs) must be well re-lubricated. All components and particularly the stem should be free of old grease before a new application of grease is applied. Recommended lubricants can be found in Table 1. Use recommended or equivalent lubricant for each individual component.

Repair or replacement components must be inspected to verify that all repair procedures have been carried out and that all replacement components (e.g. packing rings, gaskets) have been inspected for size and quality so that they will fit into the valve being serviced.

All orientation match marks assigned during disassembly must be observed during re assembly so that correct orientation is maintained.

CAUTION: Do not allow disc to strike against body seat, as this may result in valve damage and seat leakage.

4.3 GENERAL FASTENERS / MAX TORQUE VALUES

Maximum torques for all fasteners other than Retaining Ring fasteners (17B) or gland nuts (16B).

Table 2: Torque Values -
General Fasteners ft•lbs (Nm)

SIZE	B7/B16	B8M cl.2	B8M cl.1
1/4-20UNC	5(7)	5(7)	4(6)
5/16-18UNC	10(14)	10(14)	8(11)
3/8-16UNC	20(27)	20(27)	15(21)
1/2-13UNC	50(68)	45(62)	35(47)
5/8-11UNC	100(136)	85(116)	70(95)
3/4-10UNC	170(231)	150(203)	125(170)
7/8-9UNC	270(366)	200(271)	200(271)
1-8UNC	400(542)	350(475)	300(407)
1 1/8-8UN	600(814)	450(610)	450(610)
1 1/4-8UN	850(1153)	650(881)	650(881)
1 3/8-8UN	1200(1627)	900(1200)	900(1200)
1 1/2-8UN	1500(2034)	1200(1627)	1200(1627)
1 5/8-8UN	2000(2712)	-	1500(2034)
1 3/4-8UN	2500(3390)	-	1900(2576)
1 7/8-8UN	3100(4200)	-	2300(3119)
2-8UN	3800(5150)	-	2800(3797)

NOTE: 1. Torque tolerance +/- 10%
2. For temperatures above 750°F (400°C) use 75% of the torque values

5.1 TROUBLE SHOOTING CHART

Table 3: Trouble Shooting

SYMPTOM	PROBLEMS CAUSE	SOLUTION	REFERENCE SECTION
VALVE SHAFT WON'T ROTATE	Actuator has failed	Replace or Repair actuator	7
	Valve packed with debris	Flush or clean valve to remove debris	
	Shaft key has sheared	Determine cause of shearing and correct, replace shaft key	
SHAFT PACKING LEAKING	Gland fasteners loose	Tighten gland nuts	5.3
	Packing rings damaged	Depressurize valve and replace packing rings	6.2.2
	Packing is worn out	Replace packing as per procedure	6.2.2
	Stem damaged	Repair or replace stem	6.3.2 and 6.4
BOTTOM FLANGE GASKET LEAKING	Bottom flange bolting loose	Tighten bottom flange bolting to the torque table & tightening of sequence	4.3 and Table 2
	Spiral wound gasket damage	Remove valve from service and replace gasket	6.2.1
VALVE LEAKING	Valve not fully closed	Close valve 100%	
	Debris trapped in valve	Cycle and flush to remove debris	
	Seal damaged	Remove valve from service and replace seal	6.2.1
	Seat damaged	Remove valve from service and get in touch with your Velan representative	
	Actuator mechanical closure stops adjusted improperly	Adjust the stop for closure	
OPENING & CLOSING TORQUE IS EXCESSIVE	Packing too tight	Loosen packing to hand tight to the torque table, cycle valve, retighten	5.3 and Table 4
	Shaft seals are dirty or worn out	Clean or replace components as per assembly-disassembly procedure	6.3.2 and 6.4
	Shaft bent	Replace shaft	6.3.2 and 6.4
JERKY OPERATION	Actuator/shaft adapter mis-aligned	Remove actuator mounting and realign	
	Over tightened packing	Loosen packing to hand tight to the torque table, cycle valve, retighten	5.3 and Table 4
	Air supply inadequate	Increase air supply pressure	

V DETAILED MAINTENANCE

5.2 SEAT LEAKAGE

An indication of a valve leak is a pressure loss in high-pressure line side after a valve has been properly closed. In the case of hot water or steam lines, note whether the downstream pipe remains hot beyond the usual length of time.

This type of leak may be the result of:

1. Serious damage to seat or seal sealing surfaces.
2. The stress relieving temperatures that may have been used during installation; e.g. if a valve has been in excessively high temperature service for extensive period of time against Velan recommendations.
3. Valve not fully closed.
4. An erosion of laminated seal
5. A laminated seal damaged during closed/open operation OR if debris were trapped between seal and disc.

Valves, which leak, should be repaired as quickly as possible to prevent greater damage caused by high velocity and erosion. (See Section 5.1 Trouble-shooting and appropriate repair procedure.)

5.3 PACKING CHAMBER LEAKAGE

If moisture or dripping occurs around the stem and into the ID of the packing chamber, the following points must be investigated before removing the packing:

1. Check if the packing flange is torqued down to the correct torque value as shown in Torque Table 4 Torque values for gland nuts.
2. Check if the live-loading arrangement is in correct order as per drawing and compare valve live-loading arrangement confirm with drawing: if it is incorrect reassemble live loading arrangement in correct order (as per drawing), then re-torque packing flange to the correct torque value as shown in Torque Table 4 Torque values for gland nuts.
3. After re-tightening; cycle the valve three to five times and re-tighten packing flange nuts to original torque value as per torque table. Slacken the nuts slightly if torque is too high. If above steps do not stop leakage, proceed with the removal and replacement of the packing rings. (See Section 6.2.2).
4. Packing ring removal on line.

Follow warning instructions in Section 3 before replacing packing rings on line. Refer to Assembly Procedure 2 (Section 6.2.2).

Table 4: Torque Values for Gland Nuts

Valve NPS	Class	Nut Size (16A)	Torque	
			Ft•lbs	Nm
3	150	3/8	5	7
	300	3/8	5	7
4	150	3/8	6	8
	300	3/8	6	8
6	150	3/8	8	11
	300	3/8	9	12
8	150	3/8	9	12
	300	1/2	14	19
10	150	1/2	13	18
	300	1/2	23	31
12	150	1/2	14	19
	300	5/8	32	44
14	150	1/2	23	31
	300	5/8	36	50
16	150	5/8	32	44
	300	3/4	48	65
18	150	5/8	36	50
	300	3/4	53	72
20	150	3/4	48	65
	300	7/8	104	142
24	150	7/8	104	142
	300	1	137	188
30	150	1	137	188
	300	1 1/8	185	253
36	150	1 1/8	185	253
	300	1 1/2	282	386

NOTE: 1. Torque tolerance +/- 10%
2. Torque values are the minimum required for the hydro test of the body.

5.4 RETAINING RING FASTENERS

Use calibrated hand torque wrenches. If torque wrenches are not suitable or available, use standard rings or open end wrenches (spanners) by following guidelines below, as per Torque Table 5, using cross over tightening sequence and in, 25% increments.

Fasteners larger than 1¹/₈", special torque multipliers with ratio 1:7 or 1:6 should be used for torquing.

Clean all studs and nuts. Visually inspect all threads to ensure removal of all foreign matter, rust, corrosion, burrs and previous lubricants etc.

After tightening cap screws by hand, use a cross over bolt tightening sequence. This sequence depends on the quantity of fasteners used. It is recommended to number the fasteners with a marking pen in order to follow the correct sequence.

During tightening procedure; partially open and close valve a few times, this way seal will align with the seat. (Refer to valve assembly Procedures 1 & 4 (Section 6.2.1. and 6.4).

Torque:

When applying the torque to the cap screws each cap screw should be torqued in an increment of approximately 25% of the total torque shown in Torque Table 5. It will be found that as the final torque is approached the required step will become much less than 25%.

Refer to valve assembly Procedures 1 & 4 (Section 6.2.1. and 6.4).

CAUTION: If tightening sequence is not followed it is possible that the gasket will not be compressed evenly, leading to seal misalignment and may result in gasket leakage.

Over torquing can cause deformation of the retaining ring and also cause a joint leakage, and loss of seal resiliency.

Do not use impacting devices to tighten up the bolting on the retaining ring. Use suitable calibrated mechanical devices for tightening. (Torque wrench)

Use hand torque wrenches. If torque wrenches are not suitable, use the following standard wrenches.

BOLT SIZE	LENGTH OF WRENCH	
	INCH	mm
3/8"	5"	125
1/2"	6"	150
9/16"	9"	225
5/8"	12"	300
3/4"	18"	450
1"	30"	750
1 1/8"	36"	900

Table 5: Torque Values for Retaining Ring Fasteners

Valve NPS	Class	Fastener (item 17B) SS316 (F593, F837) Cond A or AF	Bolt Qty.	Torque	
				Ft•lbs	N•m
3	150/300	1/4 Hex head	6	4	6
4	150/300	1/4 Hex head	8	4	6
6	150/300	3/8 Socket head	8	11	15
8	150/300	3/8 Socket head	12	15	20
10	150/300	3/8 Socket head	16	12	17
12	150/300	3/8 Socket head	16	15	20
14	150/300	1/2 Socket head	20	24	33
16	150/300	1/2 Socket head	20	27	37
18	150/300	5/8 Socket head	20	49	67
20	150/300	5/8 Socket head	20	56	76
24	150/300	5/8 Socket head	24	78	107
30	150/300	3/4 Socket head	28	135	185
36	150/300	3/4 Socket head	32	144	197

NOTE: Torque tolerance = +/- 10%

VI MAINTENANCE PROCEDURES

6.1 BUTTERFLY VALVE EXPLODED VIEW

PARTS DESCRIPTION

- 1 - Valve body, Seat
- 2 - Disc
- 3 - Bottom cover
- 4 - Shaft
- 5 - Laminated seal
- 6 - Thrust bearing
- 7 - Retaining ring
- 11 - Packing flange
- 12 - Gland bushing
- 13A - Packing ring
- 13B - Packing ring
- 15 - Gland stud
- 16A - Gland heavy hex nut
- 16B - Taper pin hex nut (crimped)
- 17A - Actuator bracket hex. socket cap screw
- 17B - Retainer hex. socket cap screw
- 19A - Bottom cover spiral wound gasket
- 19B - Disc spiral wound gasket
- 26 - Key
- 31 - Locking plate
- 55 - Stem bearing
- 56A - Thrust bearing hex. head cap screw
- 56B - Cover heavy hex. headcap screw
- 61A - Taper pin
- 61B - Centering pin
- 63 - Packing spacer
- 78 - Actuator bracket

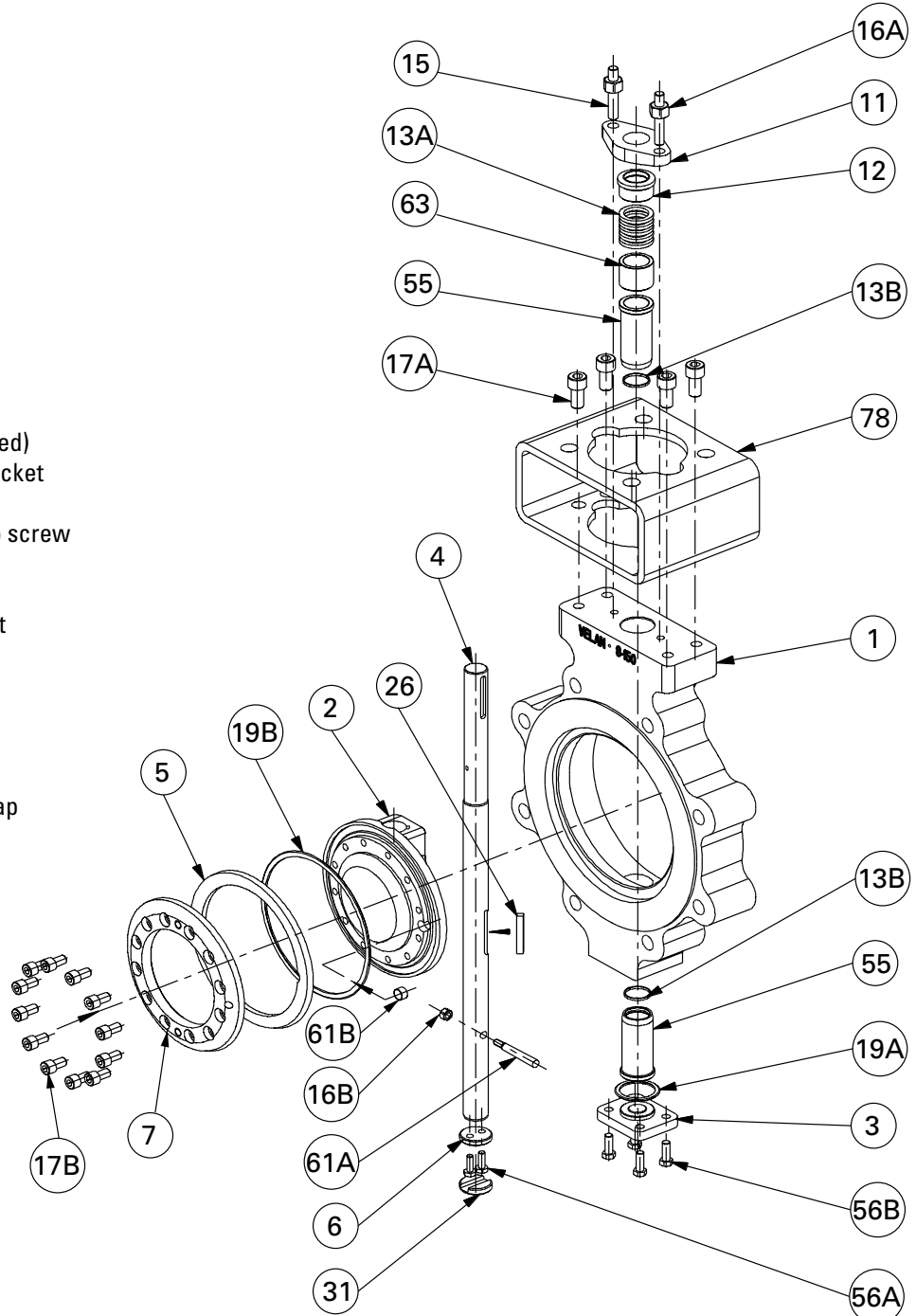


Figure 6.1.1 Butterfly Valve Exploded View

Table 6: Bill of Materials



ITEM	QTY	DESCRIPTION	UP TO 750°F (400°C)	UP TO 800°F (427°C)	UP TO 1000°F (538°C)
			CARBON STEEL, NACE	STAINLESS STEEL, NACE	WC6, C5, OR C12
1	1	Valve body	A 216 WCB	A 351 Gr. CF8M	WC6, C5 or C12
		Seat	Stellite	Stellite	Stellite
2	1	Disc	A 216 Gr. WCB nickel plated or SS 316 or A351 Gr.CF8M	A 351 Gr. CF8M	WC6, C5 or C12 nickel plated ⁽¹⁾
3	1	Bottom cover	A 105 CS	A 182 F 316	WC6, C5 or C12
4	1	Shaft	A 479 Gr. 410 H1100	A 638 Type 660	B 637 Inconel 718 nitrided
5	1	Laminated seal	Duplex + Graphite	Duplex + Graphite	Duplex + Graphite
6	1	Thrust bearing	A 479 Type 316 nitrided	A 479 Type 316 chrome plated	UNS 21800 Nitronic 60 nitrided
7	1	Retaining ring	Duplex	Duplex	Duplex
11	1	Packing flange	A 105 CS	F309	A 105 CS
12	1	Gland bushing	Type 304	Type 304	Type 304
13A	3	Packing ring	Graphite ribbon	Graphite ribbon	Graphite ribbon
13B	2	Packing ring	Graphite braided	Graphite braided	Graphite braided
13C	2	Bearing protector o-ring	Graphite braided	Graphite braided	Graphite braided
14	Opt.	Lantern ring	Stainless steel	Stainless steel	Stainless steel
15	2	Gland stud	A 193 Gr. B7	A 193 Gr. B8M	A 193 Gr. B16
16A	2	Gland heavy hex nut	A 194 Gr. 2H	A 194 Gr. 8M	A 193 Gr. B16
16B	1	Taper pin hex nut (crimped)	SS 316	SS 316	SS 316
17A	4	Actuator bracket hex. socket cap screw	Alloy steel	Alloy steel	Alloy steel
17B	set	Retainer hex. socket cap screw	SS 316	SS 316	A 193 Gr. B6
19A	1	Bottom cover spiral wound gasket	SS 347 + Graphite	SS 347 + Graphite	SS 347 + Graphite
19B	1	Disc spiral wound gasket	SS 347 + Graphite	SS 347 + Graphite	SS 347 + Graphite
26A, B	1	Key	A 479 Type 410 H1100	A 638 Type 660	A 479 Type 410 Cond. 2
31	1	Locking plate	A 479 Type 316	A 479 Type 316	UNS 21800 Nitronic 60 nitrided
55	2	Stem bearing	A 479 Type 316 nitrided	A 479 Type 316 chrome plated	UNS 21800 Nitronic 60 nitrided
56A	2	Thrust bearing hex. head cap screw	SS 316	SS 316	SS 316
56B	4	Cover heavy hex. headcap screw	A 193 Gr. B8M	A 193 Gr. B8M	A 193 Gr. B16
61A	1	Taper pin	A 479 Gr. 410 H1100	A 638 Type 660	B 637 Inconel 718 nitrided
61B	1	Centering pin	Stainless steel	Stainless steel	Stainless steel
61C	1	Assembly set screw	Alloy steel	Stainless steel	Alloy steel
78	1	Actuator bracket	Carbon steel	Carbon steel	Stainless steel
141	1	Packing spacer	Stainless steel	Stainless steel	Stainless steel

All NACE materials to be supplied in condition respective MR01.75-99.
Alternative materials for body, disc and other parts are available to meet specific conditions.
Velan reserves the right to change designs, materials or specifications without notice.

VI MAINTENANCE PROCEDURES

6.2 PARTIAL DISASSEMBLY

As general rule disassembly progresses, match mark all mating components of the valve to be returned at the same location and orientation during re-assembly.

6.2.1 Laminated Seal & Spiral Wound Gasket Replacement

Follow warning instructions before beginning disassembly (See section 3); then proceed as follows. Prior to the disassembly of live loading of packing arrangements, match mark or note the arrangement of the Belleville washers so that they can be returned to the same arrangement and orientation.

Procedure 1: Laminated Seal And Gasket Replacement

#	OPERATIONS	KEY POINTS	CONTROLS / VERIFICATIONS
1	Relieve line pressure from the valve inlet and outlet		
2	Turn valve to closed position		
3	If Valve is equipped with a leak off pipe option (lantern ring): Disconnect leak-off pipe	Leak off pipes should be unscrewed or cut approximately 6" away from the body, not at welded joint on the body	
4	Remove valve along with operator from the line		See Section 7, Actuator Disassembly
5	Clean valve inside	Remove metal shavings, dirt etc	Clean according to proper cleaning procedure outlined by the plant or according to a prescribed procedure
6	Loosen retaining ring fasteners (17B)		
7	Turn disc to OPEN position. Position "B" in Assembly Figure 6.2C	<ul style="list-style-type: none"> Provides easier access to disc For small valve sizes ($\leq 8"$) it may be required to assemble retaining ring with disc in position "C" from non-preferred side due to clearance restrictions 	See Assembly Figure 6.2C
8	Match mark mating components (retaining ring and disc) prior to disassembly		
9	Remove retaining ring fasteners		
10	Carefully remove the retaining ring (4), laminated seal (3) and spiral wound gasket (19B)	Do not damage seal and seat surfaces	
11	Inspect and clean the valve seat in the body, the gasket groove in the disc and the retaining ring		
12	Install centering pin (61B) in disc. Assembly Figure 6.2D		See Assembly Figure 6.2D
13	Assemble NEW disc spiral w/gasket (19B) and New laminated seal (5)	<ul style="list-style-type: none"> Use new gasket Laminated seal should be placed so that surface will mate properly with seat and with notch in seal located around disc alignment pin (dowel pin) 	Apply DRY GRAPHITE spray lubricant to sliding surfaces of seal (aids in free movement of seal and allows seal to find optimum position)

#	OPERATIONS	KEY POINTS	CONTROLS / VERIFICATIONS
14	Assemble retaining ring (7)	<ul style="list-style-type: none"> For small valve sizes ($\leq 8"$) it may be required to assemble retaining ring from non-preferred side with valve in open position (position "C") due to clearance restrictions Assemble retaining ring so that disc alignment pin and seal can be viewed thru retaining ring hole 	See Assembly Figure 6.2C
15	Apply Loctite to retaining ring screws (17B)		Use Loctite type 242 or Equivalent
16	Assemble retaining ring screws and hand tighten only		
17	Position Seal by closing disc by hand and observing light around seat. Alternate between checking gap between seal and seat.	<ul style="list-style-type: none"> Torque may need to be applied to RRNG screws in order to compress seal gasket. This will move seal into proper position and offset distance from stem. Seal and seat should contact uniformly around circumference. Open disc and rotate seal on disc thru small angle. Close disc and verify contact again. Continue until optimum position is found for uniform contact. 	Follow Torque Table 5 Do not exceed values shown.
18	Close valve and apply a small amount of torque to seat the laminated seal against the seat.	<ul style="list-style-type: none"> This allows laminated seal to find its optimum position to mate with the body seat 10 lbs rim-pull approx. Do not apply large torque since retaining ring screws are still loose 	
19	Slightly open valve (so that seal breaks contact with seat and close valve again as in step 27. Repeat three (3) times		
20	Close valve again as in step 27 and tighten retaining ring screws according to Torque Table 5	<ul style="list-style-type: none"> Tighten according to proper sequence and proper torque as shown in table. Torque should be applied in small increments (25 percent of final torque) so that gasket is compressed evenly 	<ul style="list-style-type: none"> Use cross-over torque tightening sequence Follow retaining ring Torque Table 5
21	Reassemble the valve and actuator in the line		
22	Test valve	Test with pressure applied to preferred side first (shaft side) and then on non-preferred side	Hydro-test to API-598 specifications.

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6.2.2 Packing Ring Replacement

Follow warning instructions before beginning Disassembly (See Section 3) then proceed as follows. Prior to the disassembly of live loading

packing arrangements, match mark or note the arrangement of the Belleville washers so that they can be returned to the same arrangement and orientation.

Procedure 2: Packing Replacement

#	OPERATIONS	KEY POINTS	CONTROLS / VERIFICATIONS
1	Loosen gland nuts (16A) and remove them from studs (15)		
2	If equipped, remove live loading system		
3	Remove Packing flange (11)		
4	Remove Gland Bushing (12)		
5	Remove Packing rings (13A), (13B)	May use packing removal tool. Do not damage packing chamber	
6	If Equipped remove the Lantern ring (14)	Upper packing can be removed by blow out from lantern ring pipe	
7	Remove remaining packing rings (13) & Junk ring (141)		
8	Clean and inspect packing chamber and internal components	If found damaged or in question, rework or replace all components as required	
9	Insert packing chamber spacer (141). Assembly Figure 6.2E	Insert into top stem bore of valve	See Assembly Figure 6.2E
10	Insert packing rings (13A)(13B)	For standard valve: Five recommended - Insert first a ribbon type then three braided type and finally a second ribbon type	Position break in rings at 90 deg intervals. Staggered
11	Insert lantern ring and remaining packing rings if so equipped		
12	Insert gland bushing (12)		
13	Install packing flange (11)		
14	Install Live loading arrangement if so equipped	As per previously noted or marked	
15	Install packing flange nuts (16A)	Hand tighten	
16	Tighten Gland nuts (16A)	<ul style="list-style-type: none"> Tighten according to table Avoid over tightening the nuts as this will increase the operating torque of the valve. final tightening will be done at hydro-test with torque applied until leakage stops. 	see Torque Table 4
17	Test valve	Test with pressure applied to preferred side first (shaft side) and then on non-preferred side	

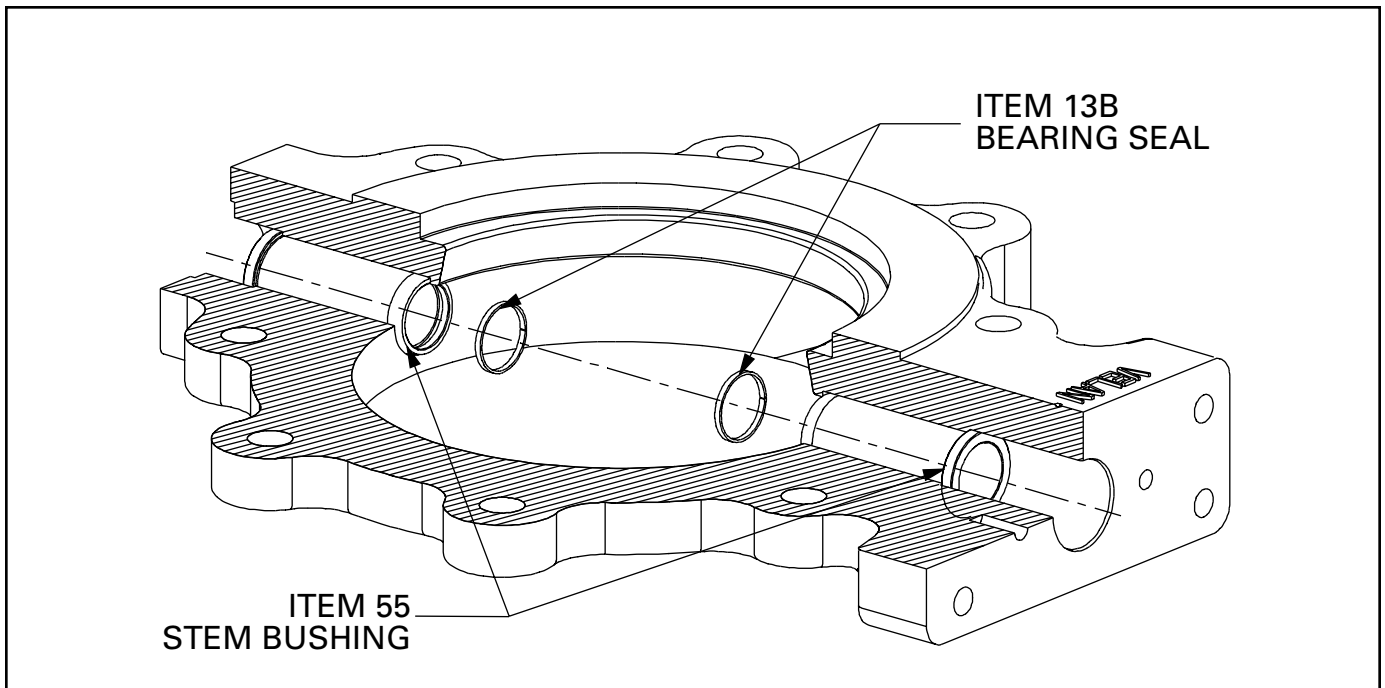


Figure 6.2A Bearing Seal Assembly

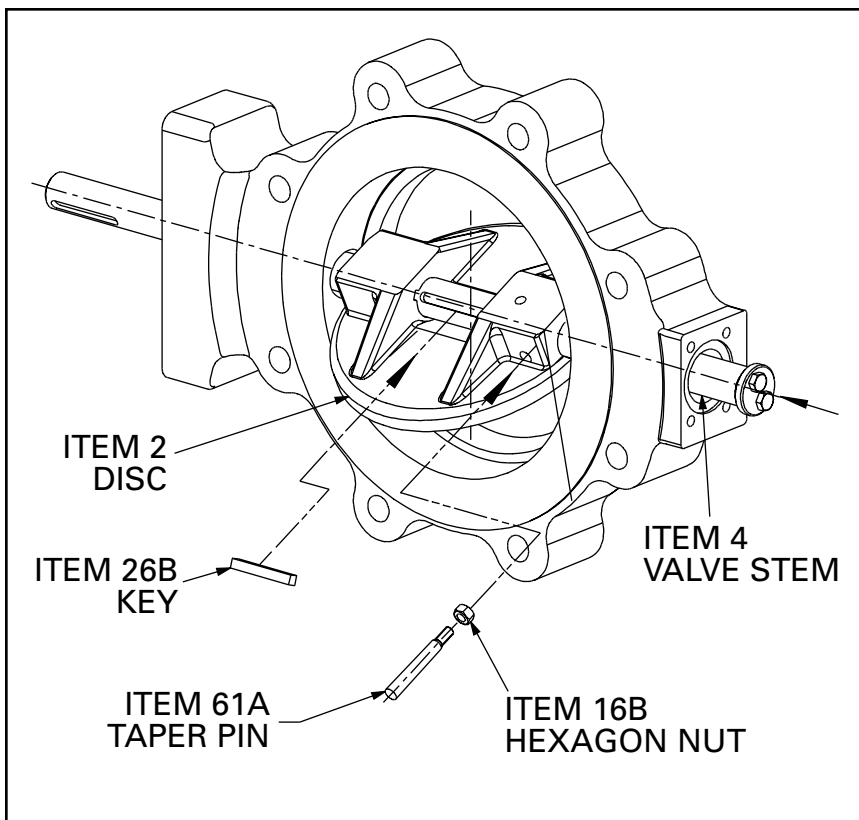


Figure 6.2B Disc and Shaft Assembly

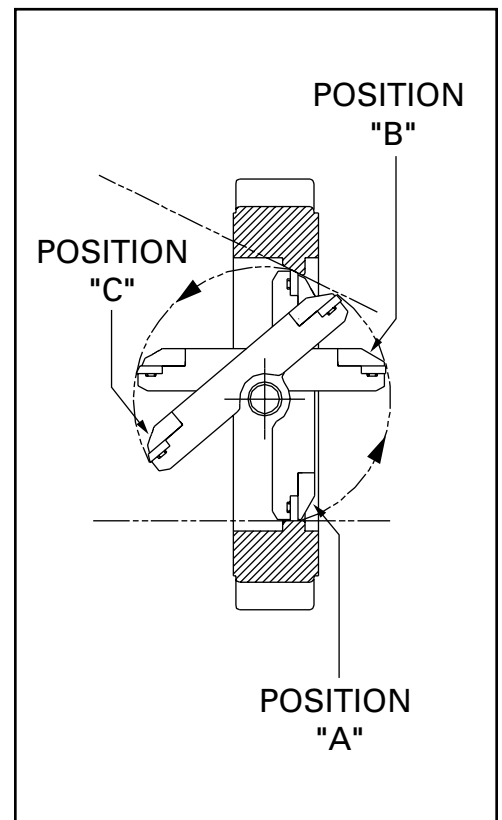


Figure 6.2C Disc Orientation

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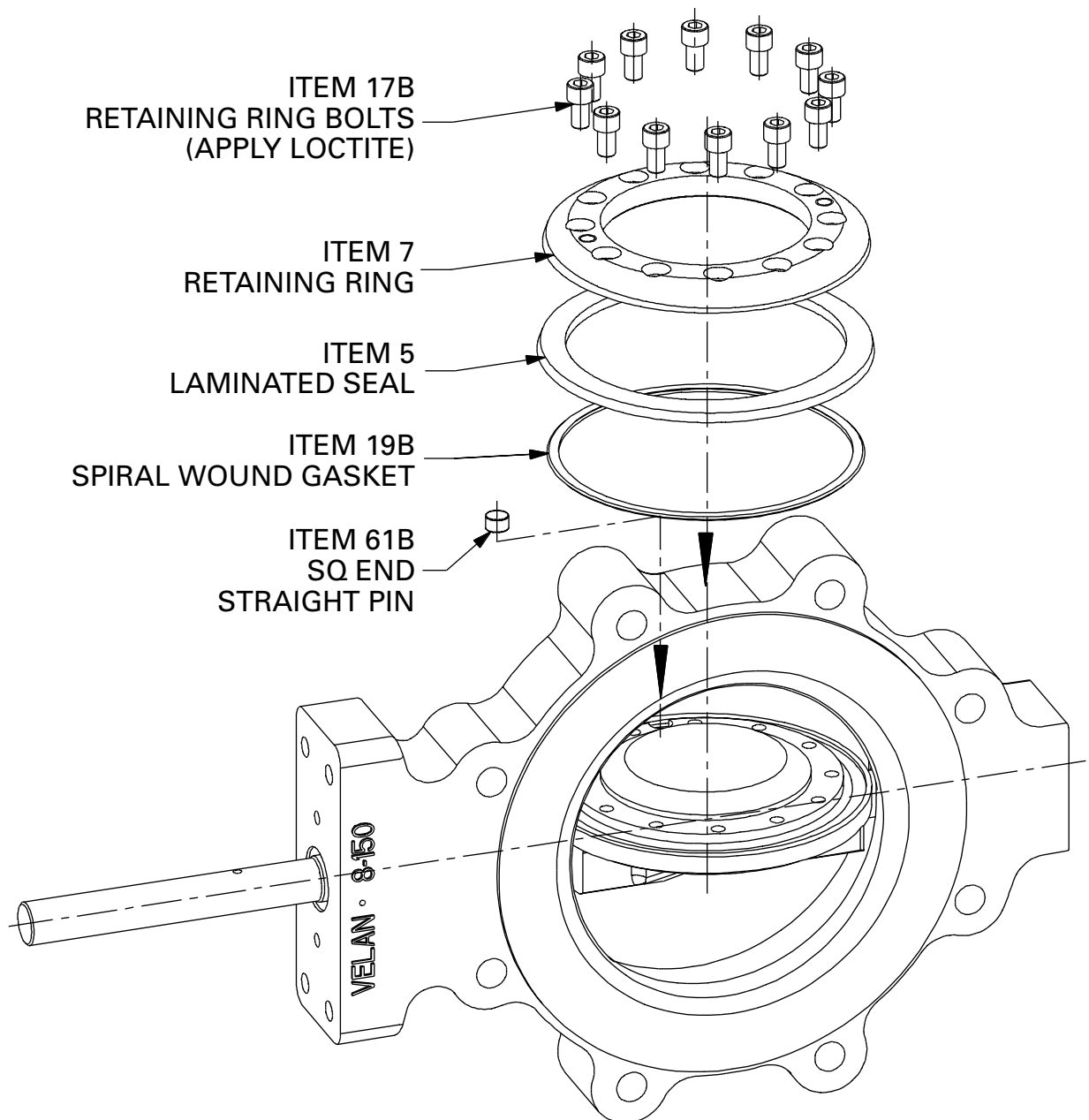


Figure 6.2D Laminated Seal and Gasket Replacement

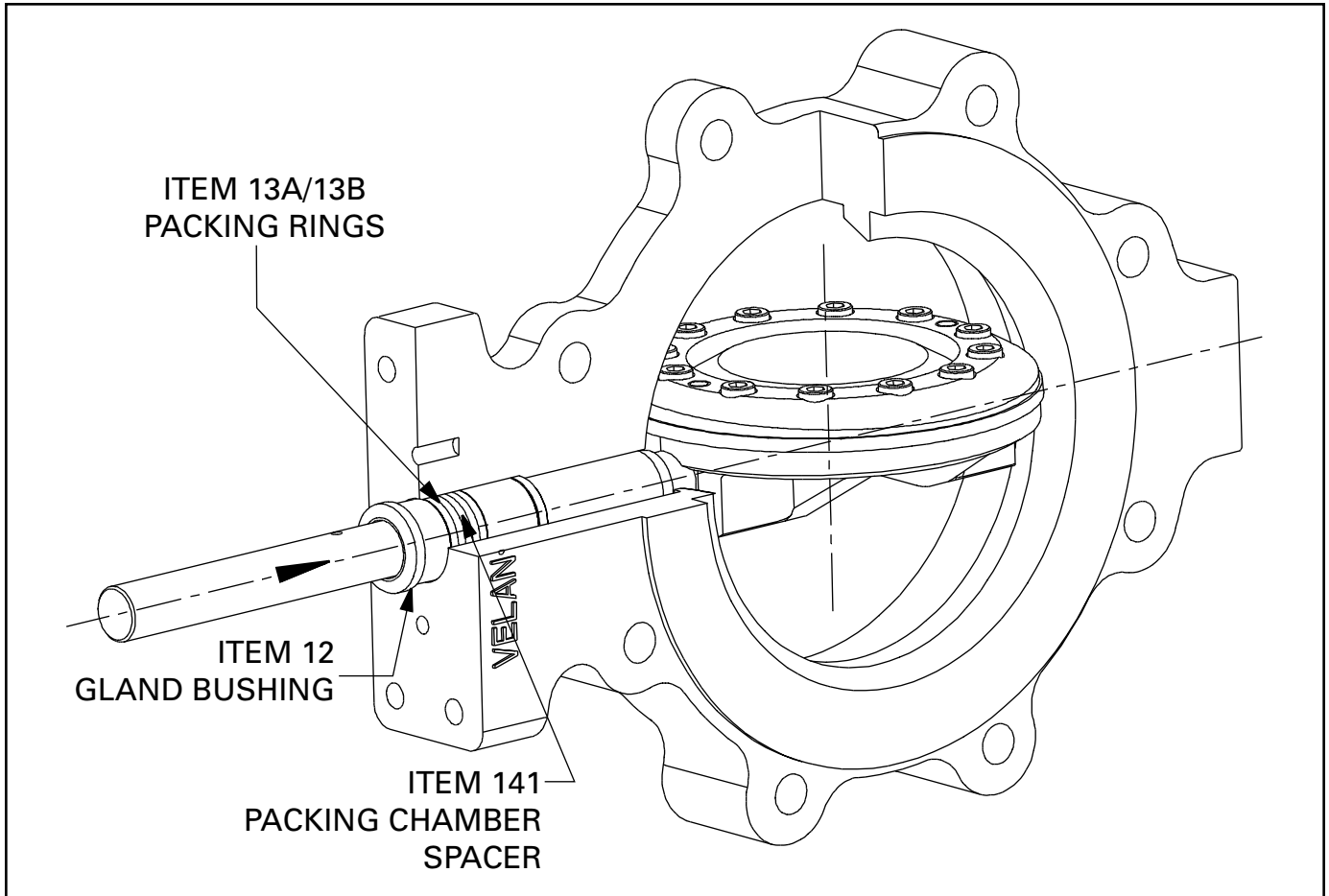


Figure 6.2E Gland Bushing and Packing Assembly

6.3 TOTAL DISASSEMBLY OF BUTTERFLY VALVE

6.3.1 General

Prior to any valve service, relieve line pressure from the both sides of the valve and place the valve into partial open position if possible. If valve is equipped with a gear or motor actuator, see Section 7.1 to 7.3 for disassembly of actuators. As general disassembly progress, place match marks on components so that the same orientation and location of components can be maintained during reassembly. If complete disassembly becomes necessary, then it is recommended all gaskets be replaced (items 19A, 19B).

6.3.2 Complete Disassembly (Procedure 3)

Please read the warning instructions carefully prior to any service or assembly to the valve or to the valve components. See WARNING Section 3.

Relieve pressure from both side of the valve (inlet and outlet) and if possible, place the valve into partial open position.

Protect valve seat surface and internal of valve with cardboard or plywood. If valve remains open for the longer period of time it is recommended to cover complete valve.

1. As a general rule in disassembly process, match mark mating components to be returned to the same location and orientation during reassembly.
2. If the valve is equipped with a leak off pipe option: disconnect leak off pipe. (Leak off pipes should be unscrewed or cut approximately 6" away from the body side and not at the welded joint at the body).

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3. Remove the valve along with the operator from line (See Section 7.1 to 7.3 for actuator disassembly).
 4. Clean the valve according to proper cleaning procedure as outlined by the plant or according to a prescribed procedure.
 5. Loosen the retainer ring screws (17B).
 6. Turn the valve disc (2) into full open position.
 7. Locate the center punch holes on the laminated seal (5) versus hole in the retainer ring (7).
 8. Remove the retainer ring screws (17B).
 9. Carefully remove the retainer ring (7)-jacking screw holes are provided, followed by laminated seal ring (5) and the spiral wound gasket (19B)
 10. Protect seat area of valve using adhesive tape if the valve is not to be reassembled immediately. Prior to dis-assembly of the actuator, disconnect relevant connections such as electric supply. Air connection etc.
 11. Remove the actuator and relevant connecting key. Disassemble actuator from the valve along with the key.
 12. Note the actuator position relative to the valve. Note or match mark location, orientation of the actuator also match mark location and orientation of bracket.
 13. Loosen the screws (17A). Note position of HP mark, then remove actuator-mounting bracket (78).
 14. Loosen the packing flange nuts (16A) and remove them from studs (15).
 15. Prior to any disassembly of the live loading arrangement please note the arrangements of Bellville washers so that they can be re-assembled in the same arrangement.
 16. Remove live loading arrangements if necessary.
 17. Remove the packing flange (11).
 18. Remove the gland bushing (12).
 19. Remove the bottom cover (3).
 20. Remove the spiral wound gasket (19A).
 21. Remove the locking plate (31).
 22. The disc (2) is connected to the stem (4) with a key (26B) in addition to the taper pin (61A). Remove the taper pin locking nut (16B) from the taper pin (61A).
 23. Protect seat by placing wood between disc and seat.
 24. Remove the taper pin (61A).
 25. Drive the stem (4) down into the bores of the disc (2) from the top (the actuator side is the top) until the key (26B) has cleared the upper disc hub. Push the stem from the top towards thrust bearing bore by using soft plastic hammer till key (26B) became visible between two hubs of the disc (2).
 26. Remove the key (26B).
 27. Remove stem out of the valve body from the bottom. Care should be taken prevent disc from falling on to seat surfaces and cause damages to the seat surfaces.
 28. Carefully remove disc from the body, do not strike disc on the seat surface.
 29. Remove packing (13A & 13B, end and middle rings).
 30. Remove the lantern ring if equipped with.
 31. Remove packing chamber spacer (141).
 32. Remove the thrust bearing (6) from the stem.
 33. Remove bearing protector (13C) from each bushing.
 34. Protect valve seat surface and internal of valve with cardboard or plywood. If valve remains open for a longer period of time it is recommended to cover complete valve.
- ### 6.3.3 Detailed Maintenance (After Total Disassembly)
1. Inspect and clean the gasket groove on the disc (2), the retainer ring (4) and the Laminated seal (3).
 2. Laminated seal should never be sanded or polished, if found damaged should be replaced with new seal.
 3. Inspect and clean the valve seat in body (1). If minor scratches or pitted are present, clean with fine abrasive cloth (n 800). Get in touch with your local Velan representative or to The Customer Service Manager if components are in question.
 4. Clean and inspect all parts (packing chamber cavity, stem, body bushings, etc...) for any damage found during inspection or if any non-conformity is found then change the non-conforming components or if possible re-work to the drawing. Spare parts can be ordered calling Velan Spare Parts Department.
- It is also a VELAN recommendation to replace parts as suggested in Section 1.1.

6.4 COMPLETE ASSEMBLY (PROCEDURE 4)

#	OPERATIONS	KEY POINTS	CONTROLS / VERIFICATIONS
	SECTION 1	PRE-LAMINATED SEAL ASSEMBLY	
1.1	Review parts list	Make sure all parts are correct number, size and material according to parts list	See Bill of Materials and Figure 6.1.1, Butterfly Valve Exploded view
1.2	Install body on assembly table	Place on side so that top and bottom bores can be accessed	
1.3	Visually inspect body, disc	<ul style="list-style-type: none"> • Verify that body seat is free of marks, scratches, or cracks • Check that disc surfaces for laminated seal and spiral w. gasket are free of tool marks, or scratches 	
1.4	Clean valve inside	Remove metal shavings, dirt etc...	
	At all times during assembly, ensure that Seat is protected from any contact which may cause damage.		
1.5	Install top and bottom bushings (55)	<ul style="list-style-type: none"> • Shrink fit required • Use liquid nitrogen to bring bushings to assembly temperature • Make sure bushing is pressed in far enough so that shoulder contacts body 	Hold in liquid until boiling stops Measure with depth gage and compare with drawing or use assembly gage
1.6	Install bearing seals (13B) into bushing groove, Assembly Figure 6.2A	Apply molykote grease to bearing seal and seal groove to hold seal in place	See Assembly Figure 6.2A
1.7	Insert shaft (4) thru bushings	Verify that stem will pass through bushings with seal installed	
1.8	Install shaft (4) thru bottom of valve and thru disc (2) as shown in Assembly Figure 6.2B	<ul style="list-style-type: none"> • Orient and align disc with stem as stem is inserted into body • Disc is oriented with keyway at top and taper pin hole at bottom 	See Assembly Figure 6.2B
1.9	Install disc key (26B)	Orient disc so that disc key can be inserted	See Assembly Figure 6.2B
1.10	Install taper pin (61A) and crimped nut (61B) in position as shown on assembly drawing	Tighten nut to specified torque	See Torque Table 4
1.11	Attach thrust washer (6) and hex head cap screws (56A) to shaft (4)	<ul style="list-style-type: none"> • Tighten screws according to table • Adjust hex head face of one screw so that it is parallel to other screw. (For assembly of locking plate) 	See Torque Table 4
1.12	Assemble locking plate (31) over thrust washer fasteners and tap until thrust washer (6) is in contact with bottom bushing (55)	Tap with wood mallet or bronze bar so that surface is not damaged	
1.13	Insert assembly shim. Attach bottom cover (3), and hex head cap screws (56B) hand tighten only	<ul style="list-style-type: none"> • Do not install bottom gasket (19A) • Bronze shim is required to hold thrw (6) in correct position 	Bottom cover fasteners (56B) should only be hand tight so that shaft can rotate freely
1.14	Verify centered position of Disc (2) in Body.	Measure clearance between Disc and Body seat at top and bottom positions while thrust washer is in contact with body	

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#	OPERATIONS	KEY POINTS	CONTROLS / VERIFICATIONS
1.15	Insert packing chamber spacer (63). Assembly Figure 6.2E	Insert into top stem bore of valve	See Assembly Figure 6.2E
1.16	Insert packing rings (13A)	Five recommended - 3 ribbon, 2 Braided (top and bottom)	Position break in rings at 90° intervals
1.17	Insert gland bushing (12)		
1.18	Install gland studs into body (15)	Turn until studs reach bottom of holes	
1.19	Install packing flange (11)		
1.20	Install packing flange nuts (16A)	Hand tighten only	
1.21	Install actuator bracket (78) and bracket screws (17A)	Hand tighten only	
1.22	Install actuator stem key (26A). Install manual gear actuator and fasteners (17C)	Hand tighten only	
	SECTION 2	LAMINATED SEAL ASSEMBLY	
2.1	Turn disc to OPEN position. Position "B" in Assembly Figure 6.2C		
2.2	Install seal alignment pin (61B) in disc. Assembly Figure 6.2D		See Assembly Figure 6.2C
2.3	Assemble disc spiral with gasket (19B) and laminated seal (5)	Laminated seal should be placed so that surface will mate properly with seat and with notch in seal located around disc alignment pin (61B).	See Assembly Figure 6.2D
2.4	Assemble retaining ring (7)	<ul style="list-style-type: none"> For small valve sizes ($\leq 8"$) it may be required to assemble retaining ring from non-preferred side with valve in open position (position "C") due to clearance restrictions Assemble retaining ring so that seal alignment pin and seal can be viewed thru retaining ring view hole 	Apply DRY GRAPHITE spray lubricant to sliding surfaces of seal (aids in free movement of seal and allows seal to find optimum position). See Table 1
2.5	Apply Loctite to retaining ring screws (17B)		See Assembly Figure 6.2C
2.6	Assemble retaining ring screws(17B).	Hand tighten only	Use Loctite type 242 or Equivalent
2.7	Close disc slowly until seal is in uniform contact with seat. Apply only light amount of torque to achieve seal/seat contact Small adjustments of seal position may be necessary is made by rotating seal on disc thru small angle. Close disc and verify contact again. Continue until uniform contact is achieved	<ul style="list-style-type: none"> Torque may need to be applied to Retainer ring screws (17B) in order to compress seal gasket. This will help to place seal in proper assembly position Loosen screws to hand tight torque 	Position laminated seal so that it is visually centered on disc
2.8	With valve in closed position, apply small amount of torque to Retainer Ring screws (17B)	To hold seal in position	Follow Torque Table 2. Do not exceed values shown
2.9	Open valve slightly and tighten all retaining ring screws (17B)	Torque should be applied in small increments (25 percent of final torque) so that gasket is compressed evenly	
2.10	With valve in closed position, shine light on one side of disc and observe any light around seal on opposite side of disc	Seal and seat should contact uniformly around circumference. No light should be visible around seal	Use cross-over torque tightening sequence. Follow Retainer Ring Torque Table 2

#	OPERATIONS	KEY POINTS	CONTROLS / VERIFICATIONS
	SECTION 3	FINAL SETUP	If light is visible in some areas then loosen rrrng fasteners (17B) and return to step 2.7
3.1	Disassemble fasteners (56B) and Bottom cover (3), Remove assembly shim		
3.2	Install bottom gasket (19B), attach bottom cover (3) and fasteners (56B)		
3.3	Set actuator bracket position	<ul style="list-style-type: none"> • Close, apply torque to valve • Bracket will turn slightly until stopped against screws • Apply final torque to bracket screws (17A) according to table 	<ul style="list-style-type: none"> • See Torque Table 4 • Verify that shaft has axial movement of .015" min. after bottom cover is assembled
3.4	Tighten Gland nuts (16A)	Tighten according to table. Avoid over tightening the nuts as this will increase the operating torque of the valve. Final tightening will be done at hydro-test	See Torque Table 4
3.5	Hydro test valve	Test with pressure applied to preferred side first (shaft side) and then on non-preferred side	See Torque Table 3
			Hydro test to API-598 specifications

Please read the warning instructions carefully prior to any valve service or assembly (Section 3.)

All pressure must be relieved from both sides of the valve before any service to valve. Velan Valves can be equipped with a variety of actuators (electrical motor, hydraulic, or pneumatic motor,...)

7.1 PROCEDURE FOR REMOVING MANUAL GEAR ACTUATOR

1. All Pressure must be relieved from both sides of the valve before removing the actuator.
2. The valve should be in a the partially open position to remove any torque on the stem and load on the actuator bolting.
3. Match mark actuator orientation to the Valve Bracket.
4. Remove all actuator bolting.
5. Remove the actuator from the valve.
6. If there is further work to be performed on the valve, refer to the proper valve disassembly and maintenance section in this manual.

7.2 PROCEDURE FOR REMOVING MOTOR ACTUATORS

Velan valves can be equipped with a variety of electrical motor actuators.

IMPORTANT: The Torque switch of the motor-actuated valve is set during factory assembly to close the valve against the specified differential pressure and requires the same attention for resetting.

WARNING: Should it become necessary to change the Torque switch setting for any reason, contact your Velan Customer Service Manager to obtain a correct new setting from the Engineering.

1. If the valve packing material is changed, the Torque switch setting must be changed.
2. Upon reassembly of the valve equipped with an electro-mechanical actuator, the open and close limit switches must be reset. Please refer to the maintenance and instruction manual provided by the actuator manufacturer for appropriate instructions.

3. When checking for proper rotation of the electrical actuator, make sure that the valve is in mid-stroke position. If the three-phase wiring connection is incorrect, the valve will close when the open button is pressed. The close torque switch will not function, which could damage the valve. If the valve does not travel in the correct direction, then simply interchange any two of the three power connections.
4. When checking for full stroke of the valve without pressure in the line, the closing torque switch should be set to its minimum value which will close the valve until all testing is finished. The Torque switch should then be reset to its recommended value.
5. All Pressure must be relieved from both sides of the valve before removing the actuator.
6. The valve should be in a the partially open position to remove any torque on the stem and load on the actuator bolting.
7. Disconnect the electrical wiring from the actuator.
8. Remove all actuator fasteners.
9. Remove the actuator from the valve.
10. If there is further work to be performed on the valve, refer to the proper valve disassembly and maintenance section in this manual.

7.3 PROCEDURE FOR REMOVING MOTOR, HYDRAULIC OR PNEUMATIC ACTUATORS

The following instructions will give you a general guide for removal and reinstallation of a hydraulic or pneumatic actuator. All hydraulic or pneumatic actuators have a connection between the valve stem and the drive sleeve of the actuator. All these connections are formed by a coupling and a square key.

1. All Pressure must be relieved from both sides of the valve before removing the actuator.
2. All air or hydraulic pressure must be relieved from actuator before disassembly.
3. The valve should be in a partially open position to remove any torque on the stem and load on the actuator fasteners. For spring return actuators, this may be achieved by turning the travel stops to a position which leaves the valve in the slightly open position. For failed open actuators, the manual override system may need to be engaged to compress the spring and position the valve in the slightly open position.

4. Match mark actuator orientation to the Valve Bracket.
5. Remove all actuator fasteners.
6. Loosen coupling. Precaution: examine coupling for setscrew or any locking device before loosening it. Note: On some actuators, it is necessary to rotate the actuator drive sleeve to remove this connection.
7. Remove the actuator from the valve.
8. If there is further work to be performed on the valve, refer to the proper valve disassembly and maintenance section in this manual.

7.4 SPARE PARTS

All parts of any valve can be ordered, but Velan does not recommend changing all parts in the field (above all for the first time). Changing these parts may require special fitting. In these cases, it is best to get in touch with your local Velan representative who will help you determine the way to restore your valve with a minimum of time and expense. When ordering spare parts, correctly determine which parts are required. Refer to the name plate on the valve for the correct figure number and order information. After this is done, present Velan with some of the following information:

1. Velan order number
 2. Velan item number (if more than one item) tag number
 3. Velan figure number and drawing number
- Or
1. Customer order number
 2. Customer item number (if more than one item) tag number
 3. Valve size, type, pressure class and drawing number.